BELLCOMM, INC.
955 L'ENFANT PLAZA NORTH, S.W. WASHINGTON, D. C. 20024

B70 06018

SUBJECT: Payload Effect of Premature S-II Center Engine Cutoff - Case 310

DATE: June 8, 1970

FROM: K. P. Klaasen

MEMORANDUM FOR FILE

A premature cutoff of the Saturn V S-II stage center engine increases the amount of S-IVB propellant required to achieve translunar injection (TLI). For an H-mission-weight spacecraft, a center engine cutoff (CECO) occurring 132.4 seconds before the nominal cutoff time (as happened on Apollo 13) increases S-IVB propellant usage by about 2450 pounds if performance is otherwise nominal. For a J-mission-weight spacecraft, the increased S-IVB propellant usage would be about 2500 pounds.

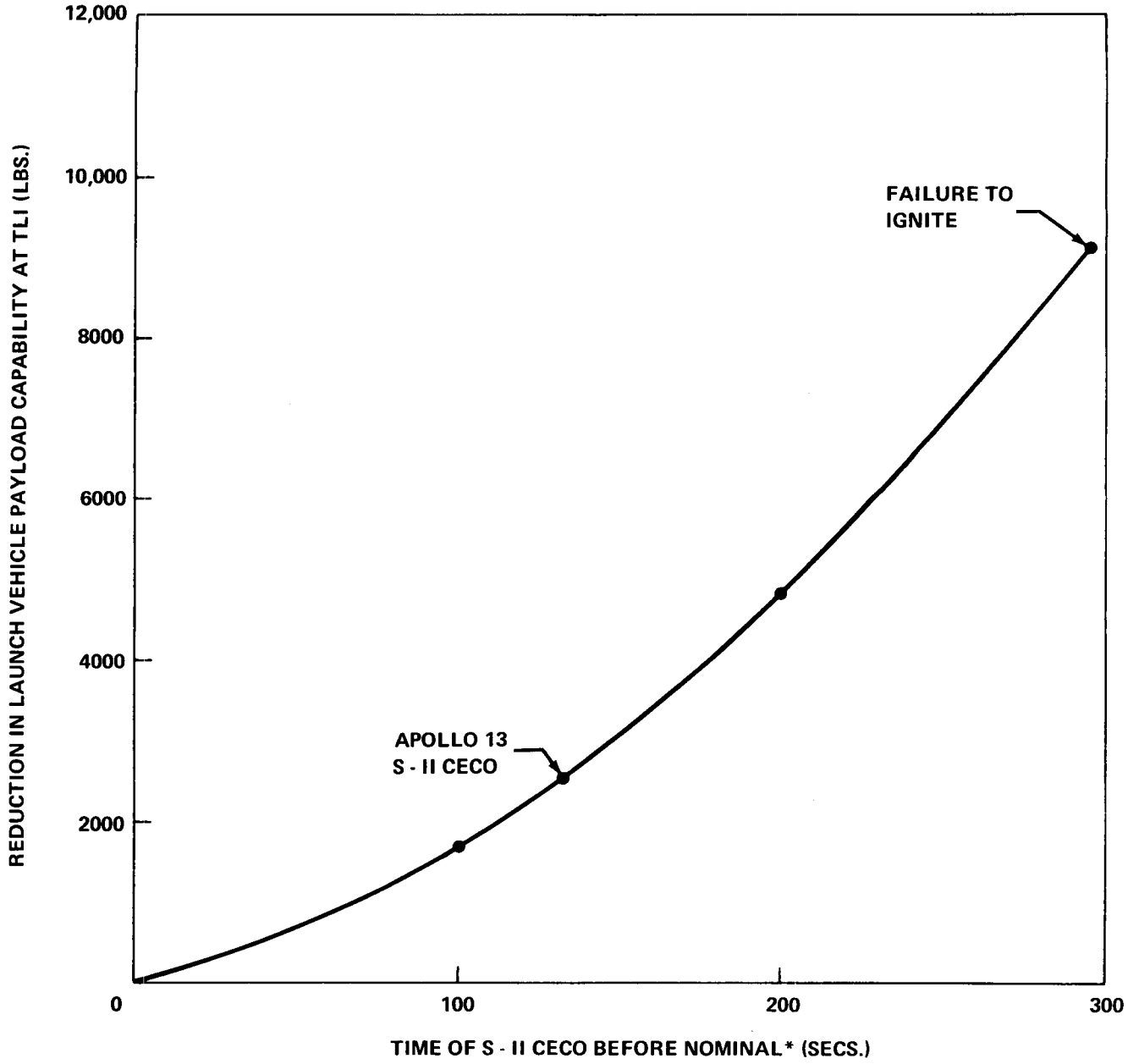
The attached figure shows the reduction which must be made in the maximum allowable launch vehicle payload in order to maintain the capability to reach TLI in the event of a premature S-II CECO. To accommodate a failure of the center engine to ignite, current payload capability would have to be reduced by about 9100 pounds.

The required payload capability reductions were determined using the Bellcomm Apollo Simulation Program (BCMASP). Trajectories were flown in a modified target mode. In this mode, the vehicle followed a nominal trajectory until S-II CECO at which point new targeting was done in order to meet the proper earth-orbital conditions. Apollo 13 trajectory data and launch vehicle weight and performance data were used. A J-mission-weight spacecraft was assumed for the nominal trajectory. For the case of a premature S-II CECO, the spacecraft weight was reduced until the quantity of S-IVB propellant burned equalled the quantity of propellant burned for the nominal trajectory.

K.P. Klaasen

2013-KPK-slr K. P. Klaasen

Attachment



*NOMINAL S - II CECO OCCURS 95 SECS. BEFORE OUTBOARD ENGINE CUTOFF

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